



Full wwPDB EM Validation Report ⓘ

Mar 20, 2026 – 06:30 AM UTC

PDB ID : 7NB8 / pdb_00007nb8
EMDB ID : EMD-12257
Title : Plasmodium falciparum kinesin-5 motor domain without nucleotide, complexed with 14 protofilament microtubule.
Authors : Cook, A.D.; Roberts, A.; Atherton, J.; Tewari, R.; Topf, M.; Moores, C.A.
Deposited on : 2021-01-25
Resolution : 4.40 Å(reported)
Based on initial model : 3HQD

This is a Full wwPDB EM Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

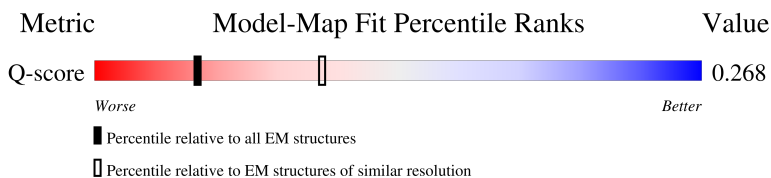
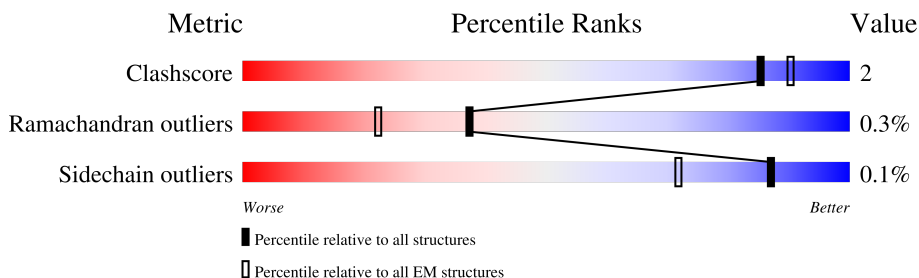
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 4.40 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	3132 (3.91 - 4.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion $< 40\%$). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	451	12% 90% 5%
2	B	445	10% 87% 8%
3	K	405	16% 71% 8% 20%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 18570 atoms, of which 9185 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Tubulin alpha-1B chain.

Mol	Chain	Residues	Atoms						AltConf	Trace
1	A	428	Total	C	H	N	O	S	0	0
			6636	2130	3278	571	635	22		

- Molecule 2 is a protein called Tubulin beta chain.

Mol	Chain	Residues	Atoms						AltConf	Trace
2	B	426	Total	C	H	N	O	S	0	0
			6588	2106	3237	575	644	26		

- Molecule 3 is a protein called Kinesin-5.

Mol	Chain	Residues	Atoms						AltConf	Trace
3	K	323	Total	C	H	N	O	S	0	0
			5280	1649	2670	440	509	12		

There are 100 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
K	1	GLY	-	expression tag	UNP O77382
K	2	ILE	-	expression tag	UNP O77382
K	3	ASP	-	expression tag	UNP O77382
K	4	PRO	-	expression tag	UNP O77382
K	5	PHE	-	expression tag	UNP O77382
K	6	THR	-	expression tag	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	GLY	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	PHE	deletion	UNP O77382
K	?	-	ASP	deletion	UNP O77382
K	?	-	GLU	deletion	UNP O77382

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Chain	Residue	Modelled	Actual	Comment	Reference
K	?	-	LYS	deletion	UNP O77382
K	?	-	ASP	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	GLU	deletion	UNP O77382
K	?	-	HIS	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	VAL	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	GLU	deletion	UNP O77382
K	?	-	THR	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	GLY	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	TYR	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	LEU	deletion	UNP O77382
K	?	-	LEU	deletion	UNP O77382
K	?	-	CYS	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	ASP	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASP	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	TYR	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382

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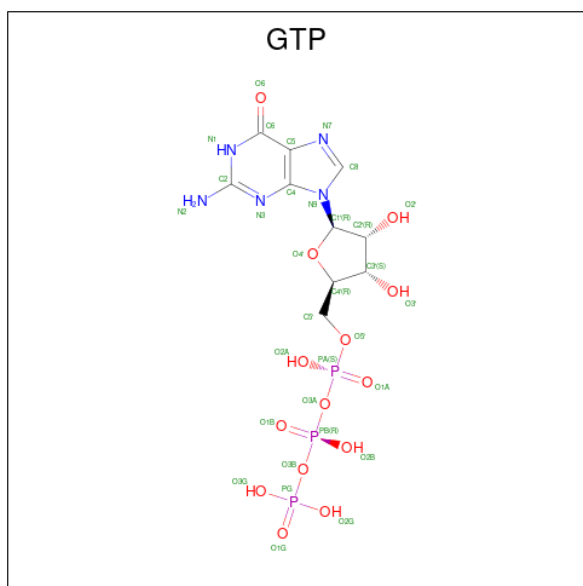
Chain	Residue	Modelled	Actual	Comment	Reference
K	?	-	ASN	deletion	UNP O77382
K	?	-	LEU	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	GLU	deletion	UNP O77382
K	?	-	PRO	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	LEU	deletion	UNP O77382
K	?	-	LEU	deletion	UNP O77382
K	?	-	VAL	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	GLU	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	SER	deletion	UNP O77382
K	?	-	ARG	deletion	UNP O77382
K	?	-	ASP	deletion	UNP O77382
K	?	-	ILE	deletion	UNP O77382
K	?	-	THR	deletion	UNP O77382
K	?	-	CYS	deletion	UNP O77382
K	?	-	ASP	deletion	UNP O77382
K	?	-	VAL	deletion	UNP O77382
K	?	-	VAL	deletion	UNP O77382
K	?	-	GLN	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	CYS	deletion	UNP O77382
K	?	-	SER	deletion	UNP O77382
K	?	-	VAL	deletion	UNP O77382
K	?	-	ASP	deletion	UNP O77382
K	?	-	LYS	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ARG	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASN	deletion	UNP O77382
K	?	-	ASP	deletion	UNP O77382
K	?	-	MET	deletion	UNP O77382
K	?	-	TYR	deletion	UNP O77382
K	?	-	GLN	deletion	UNP O77382
K	?	-	THR	deletion	UNP O77382
K	?	-	PHE	deletion	UNP O77382

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Chain	Residue	Modelled	Actual	Comment	Reference
K	?	-	ASP	deletion	UNP O77382

- Molecule 4 is GUANOSINE-5'-TRIPHOSPHATE (CCD ID: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).

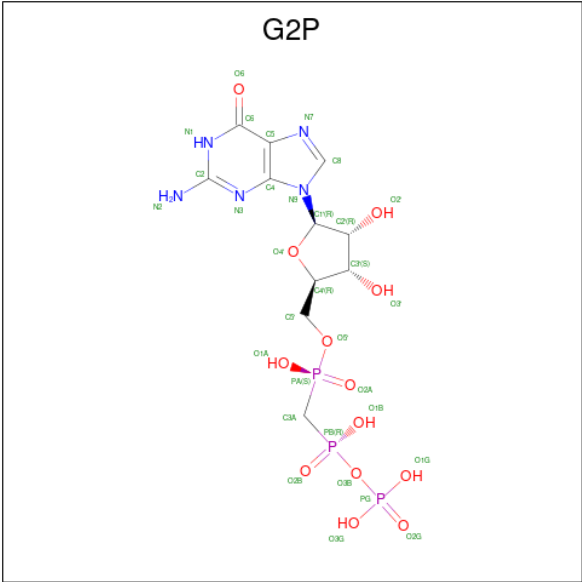


Mol	Chain	Residues	Atoms					AltConf
4	A	1	Total	C	N	O	P	0
			32	10	5	14	3	

- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
5	A	1	Total	Mg	0
			1	1	
5	B	1	Total	Mg	0
			1	1	

- Molecule 6 is PHOSPHOMETHYLPHOSPHONIC ACID GUANYLATE ESTER (CCD ID: G2P) (formula: $C_{11}H_{18}N_5O_{13}P_3$).

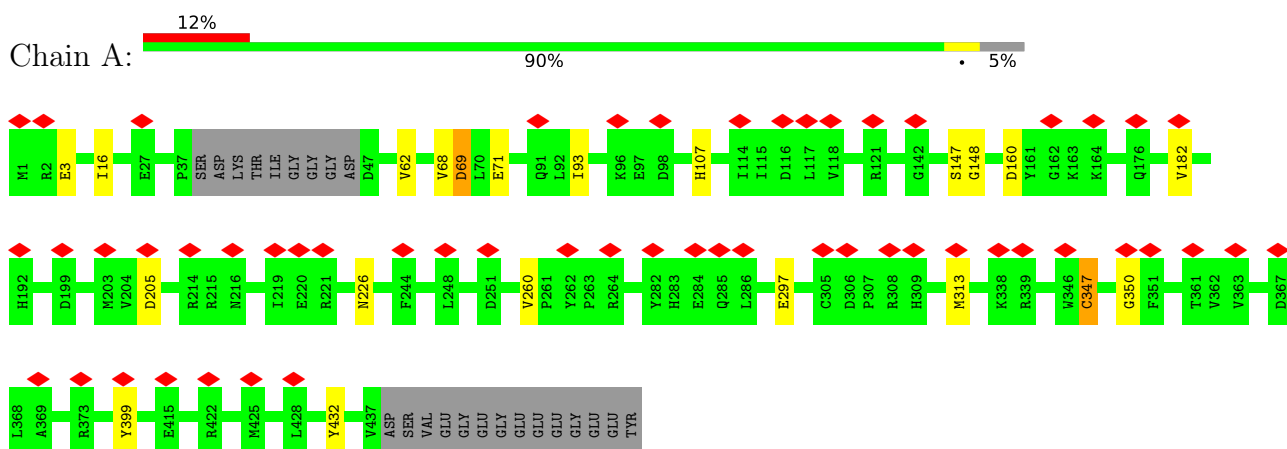


Mol	Chain	Residues	Atoms					AltConf
6	B	1	Total	C	N	O	P	0
			32	11	5	13	3	

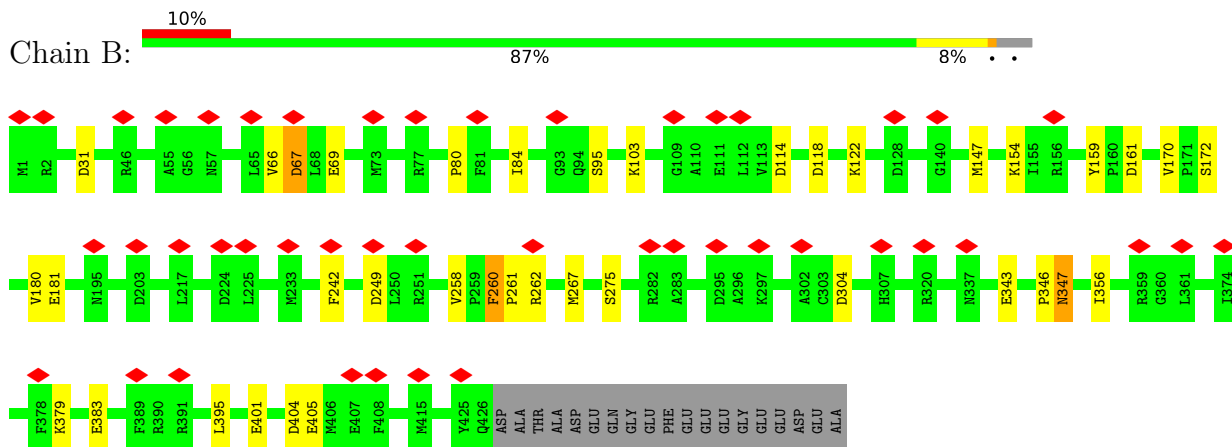
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

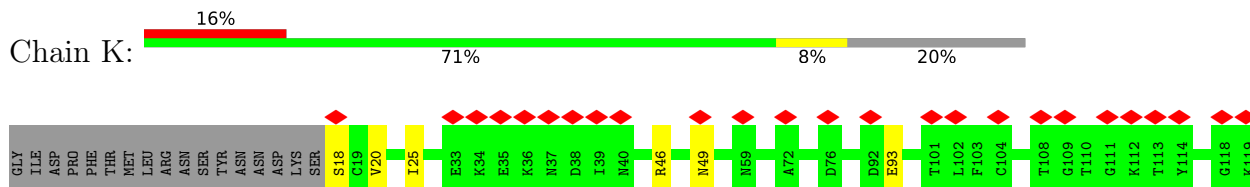
- Molecule 1: Tubulin alpha-1B chain

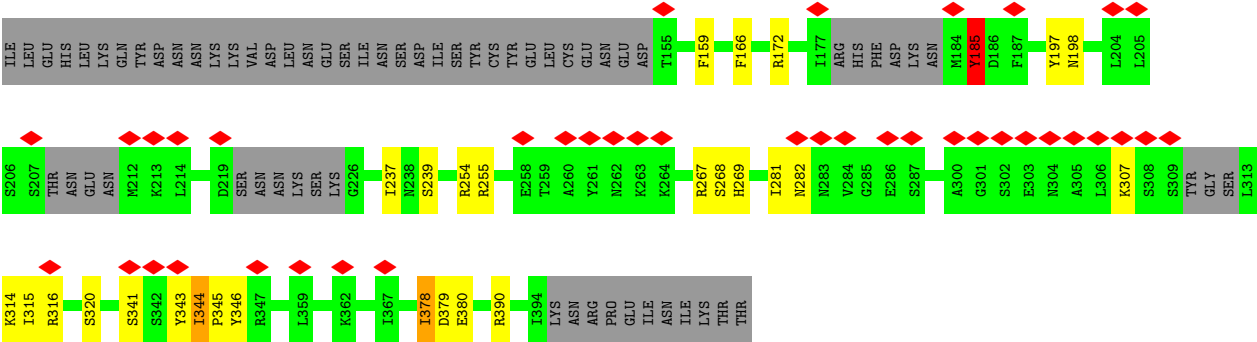


- Molecule 2: Tubulin beta chain



- Molecule 3: Kinesin-5





4 Experimental information

Property	Value	Source
EM reconstruction method	HELICAL	Depositor
Imposed symmetry	HELICAL, twist=-25.75°, rise=8.93 Å, axial sym=C1	Depositor
Number of segments used	73684	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING ONLY	Depositor
Microscope	FEI POLARA 300	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	58	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.174	Depositor
Minimum map value	0.000	Depositor
Average map value	0.007	Depositor
Map value standard deviation	0.019	Depositor
Recommended contour level	0.05	Depositor
Map size (Å)	93.13, 108.42, 107.03	wwPDB
Map dimensions	67, 78, 77	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.39, 1.39, 1.39	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: GTP, G2P, MG

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.94	1/3435 (0.0%)	1.20	21/4663 (0.5%)
2	B	0.96	3/3426 (0.1%)	1.22	27/4641 (0.6%)
3	K	1.04	0/2636	1.34	20/3539 (0.6%)
All	All	0.97	4/9497 (0.0%)	1.25	68/12843 (0.5%)

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	67	ASP	CB-CG	13.20	1.85	1.52
1	A	69	ASP	CB-CG	10.50	1.78	1.52
2	B	67	ASP	N-CA	5.35	1.52	1.46
2	B	67	ASP	CA-CB	5.30	1.62	1.53

All (68) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	260	VAL	N-CA-C	10.22	116.86	107.56
2	B	249	ASP	CA-CB-CG	7.62	120.22	112.60
1	A	205	ASP	CA-CB-CG	7.28	119.88	112.60
3	K	185	TYR	N-CA-C	-7.17	101.67	113.50
3	K	320	SER	N-CA-C	-7.14	103.50	111.28
2	B	84	ILE	N-CA-C	-7.12	105.69	111.81
2	B	66	VAL	N-CA-C	7.09	118.52	108.17
2	B	258	VAL	N-CA-C	6.82	114.90	108.15
2	B	242	PHE	CA-C-N	6.62	127.01	119.92
2	B	242	PHE	C-N-CA	6.62	127.01	119.92
2	B	69	GLU	CA-C-N	6.28	127.69	119.84
2	B	69	GLU	C-N-CA	6.28	127.69	119.84
3	K	49	ASN	N-CA-C	6.10	118.72	111.33
3	K	344	ILE	CA-C-N	6.09	125.77	119.56

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	K	344	ILE	C-N-CA	6.09	125.77	119.56
1	A	93	ILE	N-CA-C	6.00	116.51	108.11
3	K	239	SER	N-CA-C	5.80	118.09	108.99
2	B	159	TYR	CA-C-N	5.79	125.89	119.87
2	B	159	TYR	C-N-CA	5.79	125.89	119.87
1	A	62	VAL	CA-C-N	5.77	125.53	119.76
1	A	62	VAL	C-N-CA	5.77	125.53	119.76
3	K	269	HIS	N-CA-C	-5.75	101.18	110.32
2	B	170	VAL	CA-C-N	5.68	125.58	119.85
2	B	170	VAL	C-N-CA	5.68	125.58	119.85
3	K	282	ASN	CA-CB-CG	5.68	118.28	112.60
3	K	166	PHE	CA-CB-CG	-5.65	108.15	113.80
1	A	16	ILE	N-CA-C	-5.63	104.88	110.62
1	A	68	VAL	N-CA-C	5.62	116.22	108.12
1	A	260	VAL	CA-C-N	5.62	125.32	119.64
1	A	260	VAL	C-N-CA	5.62	125.32	119.64
1	A	226	ASN	N-CA-C	-5.59	104.81	111.69
3	K	254	ARG	NE-CZ-NH2	5.55	124.19	119.20
1	A	350	GLY	N-CA-C	5.47	120.55	113.27
3	K	46	ARG	CA-C-N	-5.47	116.00	123.12
3	K	46	ARG	C-N-CA	-5.47	116.00	123.12
2	B	172	SER	CA-C-N	5.47	125.14	119.56
2	B	172	SER	C-N-CA	5.47	125.14	119.56
2	B	260	PHE	CA-C-N	5.46	126.66	119.84
2	B	260	PHE	C-N-CA	5.46	126.66	119.84
3	K	378	ILE	N-CA-C	5.39	116.17	110.72
2	B	356	ILE	CA-C-N	5.39	125.93	120.38
2	B	356	ILE	C-N-CA	5.39	125.93	120.38
1	A	182	VAL	N-CA-C	-5.36	107.25	112.29
3	K	268	SER	N-CA-C	5.35	117.20	109.07
2	B	275	SER	N-CA-C	-5.34	103.64	110.53
3	K	172	ARG	NE-CZ-NH2	5.33	124.00	119.20
2	B	80	PRO	N-CA-C	-5.33	102.91	111.38
3	K	237	ILE	N-CA-C	5.24	115.51	108.17
1	A	3	GLU	N-CA-C	5.22	116.78	108.79
1	A	71	GLU	CA-C-N	5.22	125.52	119.47
1	A	71	GLU	C-N-CA	5.22	125.52	119.47
2	B	31	ASP	CA-C-N	5.19	126.33	119.84
2	B	31	ASP	C-N-CA	5.19	126.33	119.84
3	K	341	SER	CA-C-N	5.16	130.37	121.86
3	K	341	SER	C-N-CA	5.16	130.37	121.86
3	K	185	TYR	CA-C-O	5.11	124.11	118.65

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	267	MET	CA-C-N	5.10	125.31	120.31
2	B	267	MET	C-N-CA	5.10	125.31	120.31
3	K	159	PHE	CA-CB-CG	-5.09	108.70	113.80
1	A	160	ASP	CA-CB-CG	5.08	117.68	112.60
1	A	313	MET	N-CA-C	-5.08	105.83	112.23
1	A	347	CYS	CA-C-N	5.07	124.78	119.82
1	A	347	CYS	C-N-CA	5.07	124.78	119.82
2	B	258	VAL	CB-CA-C	-5.03	106.30	111.08
1	A	297	GLU	CA-C-N	5.02	125.29	119.47
1	A	297	GLU	C-N-CA	5.02	125.29	119.47
2	B	304	ASP	CA-C-N	5.00	125.28	119.47
2	B	304	ASP	C-N-CA	5.00	125.28	119.47

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3358	3278	3277	9	0
2	B	3351	3237	3237	13	0
3	K	2610	2670	2664	18	0
4	A	32	0	12	2	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
6	B	32	0	14	0	0
All	All	9385	9185	9204	40	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (40) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:69:ASP:CB	1:A:69:ASP:CG	1.78	1.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:67:ASP:CB	2:B:67:ASP:CG	1.85	1.50
3:K:20:VAL:HG12	3:K:20:VAL:O	1.79	0.79
3:K:185:TYR:O	3:K:185:TYR:HD2	1.77	0.68
1:A:347:CYS:SG	1:A:347:CYS:O	2.54	0.64
2:B:343:GLU:OE1	2:B:343:GLU:N	2.26	0.62
3:K:25:ILE:O	3:K:25:ILE:HG23	2.07	0.55
4:A:500:GTP:H5''	4:A:500:GTP:C8	2.42	0.55
2:B:118:ASP:OD2	2:B:122:LYS:NZ	2.40	0.54
2:B:161:ASP:OD2	3:K:314:LYS:NZ	2.42	0.53
2:B:114:ASP:OD1	2:B:154:LYS:NZ	2.42	0.53
3:K:18:SER:N	3:K:93:GLU:OE1	2.42	0.52
3:K:346:TYR:CD1	3:K:346:TYR:N	2.77	0.51
3:K:185:TYR:O	3:K:185:TYR:CD2	2.62	0.50
1:A:107:HIS:HD2	1:A:107:HIS:O	1.96	0.49
3:K:346:TYR:N	3:K:346:TYR:HD1	2.11	0.49
3:K:307:LYS:NZ	3:K:380:GLU:OE1	2.47	0.48
3:K:197:TYR:CE2	3:K:255:ARG:HB2	2.49	0.48
1:A:147:SER:OG	1:A:148:GLY:N	2.47	0.48
3:K:267:ARG:O	3:K:267:ARG:HG3	2.13	0.47
4:A:500:GTP:C8	4:A:500:GTP:C5'	2.99	0.46
3:K:20:VAL:O	3:K:20:VAL:CG1	2.51	0.46
2:B:180:VAL:O	2:B:181:GLU:C	2.58	0.46
2:B:260:PHE:O	2:B:262:ARG:N	2.49	0.46
2:B:404:ASP:OD1	2:B:405:GLU:N	2.49	0.46
1:A:432:TYR:N	1:A:432:TYR:CD1	2.83	0.45
2:B:147:MET:HB3	2:B:147:MET:HE3	1.84	0.44
1:A:399:TYR:OH	3:K:390:ARG:NH2	2.51	0.44
2:B:346:PRO:O	2:B:347:ASN:CB	2.66	0.42
1:A:107:HIS:O	1:A:107:HIS:CD2	2.73	0.41
3:K:343:TYR:O	3:K:344:ILE:C	2.60	0.41
2:B:103:LYS:NZ	2:B:401:GLU:OE2	2.50	0.41
3:K:378:ILE:O	3:K:379:ASP:C	2.62	0.41
3:K:315:ILE:O	3:K:316:ARG:C	2.61	0.41
3:K:197:TYR:O	3:K:198:ASN:C	2.64	0.41
3:K:344:ILE:N	3:K:345:PRO:CD	2.84	0.41
1:A:432:TYR:N	1:A:432:TYR:HD1	2.18	0.40
1:A:107:HIS:CD2	1:A:107:HIS:C	2.99	0.40
2:B:379:LYS:NZ	2:B:383:GLU:OE2	2.51	0.40
2:B:395:LEU:HD12	2:B:395:LEU:HA	1.89	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	424/451 (94%)	415 (98%)	9 (2%)	0	100	100
2	B	424/445 (95%)	406 (96%)	15 (4%)	3 (1%)	18	55
3	K	311/405 (77%)	301 (97%)	9 (3%)	1 (0%)	36	71
All	All	1159/1301 (89%)	1122 (97%)	33 (3%)	4 (0%)	37	71

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	347	ASN
2	B	261	PRO
2	B	95	SER
3	K	281	ILE

5.3.2 Protein sidechains

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	362/379 (96%)	362 (100%)	0	100	100
2	B	367/381 (96%)	367 (100%)	0	100	100
3	K	302/382 (79%)	301 (100%)	1 (0%)	86	84
All	All	1031/1142 (90%)	1030 (100%)	1 (0%)	87	88

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	K	185	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	195	ASN
2	B	204	ASN
2	B	424	GLN
3	K	57	ASN
3	K	295	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 2 are monoatomic - leaving 2 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
6	G2P	B	500	5	30,34,34	1.85	8 (26%)	46,54,54	2.25	15 (32%)
4	GTP	A	500	5	33,34,34	1.17	4 (12%)	50,54,54	1.98	10 (20%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	G2P	B	500	5	-	3/19/38/38	0/3/3/3
4	GTP	A	500	5	-	6/22/38/38	0/3/3/3

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	500	G2P	PA-O2A	4.23	1.61	1.51
6	B	500	G2P	PB-O2B	4.23	1.61	1.51
6	B	500	G2P	PB-O1B	-3.41	1.48	1.56
6	B	500	G2P	PA-O1A	-3.22	1.48	1.56
6	B	500	G2P	C5-C4	3.11	1.47	1.38
4	A	500	GTP	C6-N1	-2.99	1.33	1.38
4	A	500	GTP	C5-C4	2.60	1.45	1.38
4	A	500	GTP	C5-N7	-2.58	1.33	1.39
6	B	500	G2P	PB-O3B	2.50	1.61	1.58
4	A	500	GTP	C4-N9	-2.37	1.32	1.38
6	B	500	G2P	C6-N1	-2.29	1.34	1.38
6	B	500	G2P	C5-N7	-2.16	1.34	1.39

All (25) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	500	GTP	C5-C4-N3	-6.44	118.14	128.39
6	B	500	G2P	C5-C4-N3	-5.97	118.89	128.39
4	A	500	GTP	C6-C5-N7	5.52	140.34	130.29
6	B	500	G2P	C2-N3-C4	5.01	120.94	112.30
4	A	500	GTP	C2-N3-C4	4.75	120.48	112.30
6	B	500	G2P	O4'-C4'-C3'	-4.61	95.99	105.15
4	A	500	GTP	C4-C5-N7	-4.11	104.17	110.67
6	B	500	G2P	N9-C4-N3	4.09	134.13	125.95
4	A	500	GTP	N9-C4-N3	3.63	133.22	125.95
6	B	500	G2P	C6-C5-N7	3.62	136.88	130.29
6	B	500	G2P	C3'-C2'-C1'	-3.55	94.75	101.46
6	B	500	G2P	O2'-C2'-C3'	-3.40	100.91	111.82
6	B	500	G2P	O2A-PA-C3A	3.25	117.62	109.05
6	B	500	G2P	C4-C5-N7	-3.06	105.82	110.67
6	B	500	G2P	O1B-PB-O2B	2.95	119.56	109.95
6	B	500	G2P	O2'-C2'-C1'	2.88	120.02	110.10

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	500	G2P	PB-O3B-PG	-2.80	122.40	132.45
4	A	500	GTP	C2-N1-C6	-2.65	120.30	125.11
4	A	500	GTP	C1'-N9-C4	-2.56	118.92	126.49
4	A	500	GTP	C6-C5-C4	-2.31	115.35	118.83
4	A	500	GTP	O2B-PB-O3A	2.25	113.35	107.27
6	B	500	G2P	C8-N7-C5	2.23	108.24	104.26
6	B	500	G2P	O3'-C3'-C2'	2.03	118.34	111.82
6	B	500	G2P	O5'-C5'-C4'	-2.03	102.08	108.99
4	A	500	GTP	O3G-PG-O1G	2.03	118.73	110.83

There are no chirality outliers.

All (9) torsion outliers are listed below:

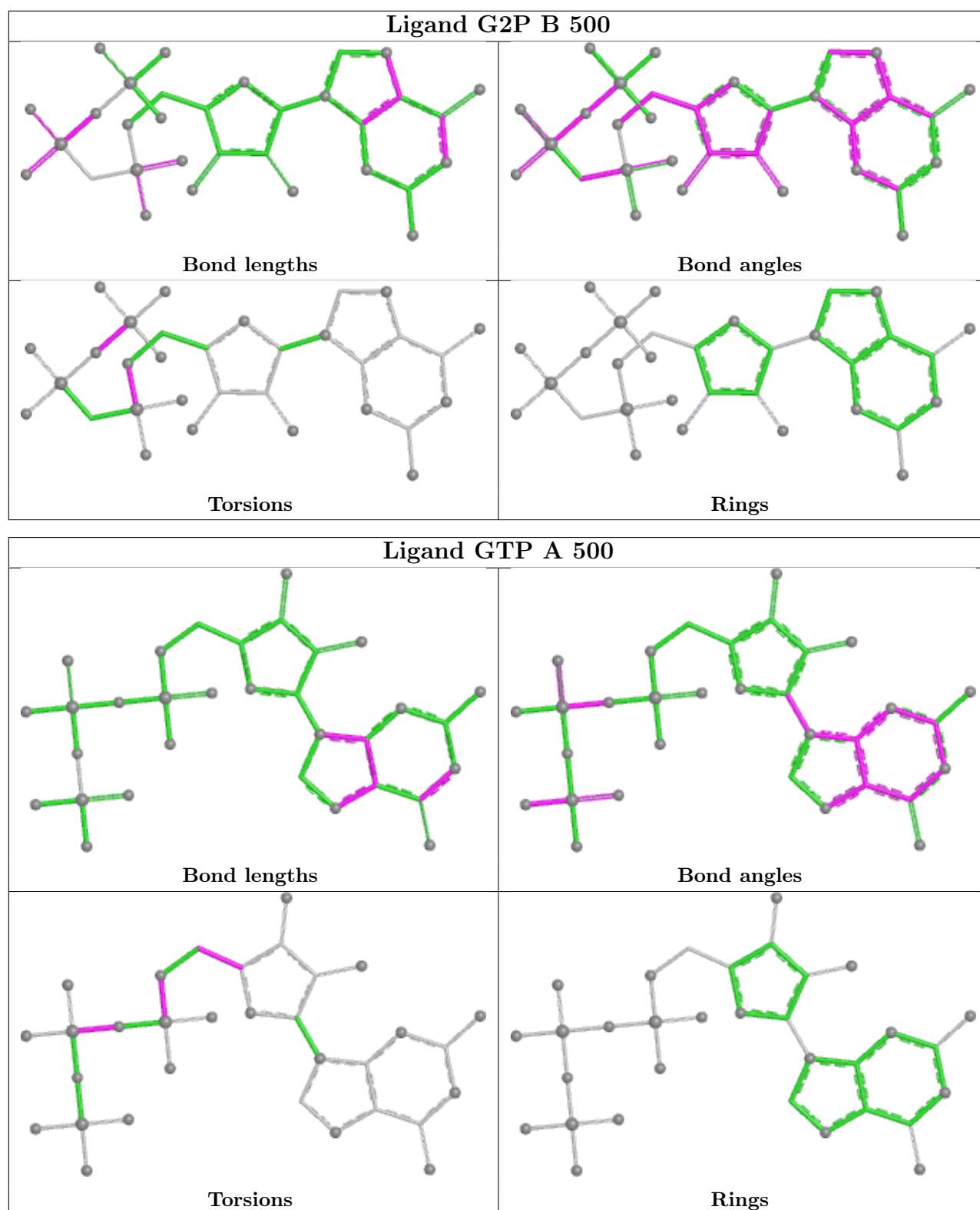
Mol	Chain	Res	Type	Atoms
4	A	500	GTP	C5'-O5'-PA-O3A
4	A	500	GTP	O4'-C4'-C5'-O5'
4	A	500	GTP	C3'-C4'-C5'-O5'
4	A	500	GTP	PA-O3A-PB-O1B
4	A	500	GTP	C5'-O5'-PA-O1A
6	B	500	G2P	C5'-O5'-PA-O1A
6	B	500	G2P	PB-O3B-PG-O1G
6	B	500	G2P	C5'-O5'-PA-C3A
4	A	500	GTP	PA-O3A-PB-O2B

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	500	GTP	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

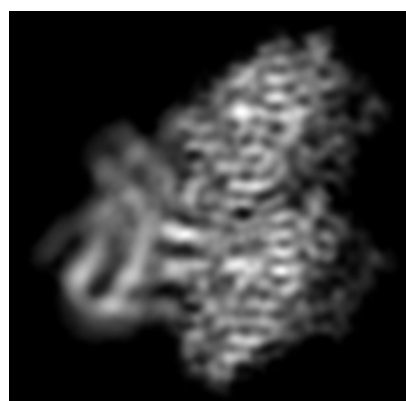
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-12257. These allow visual inspection of the internal detail of the map and identification of artifacts.

No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

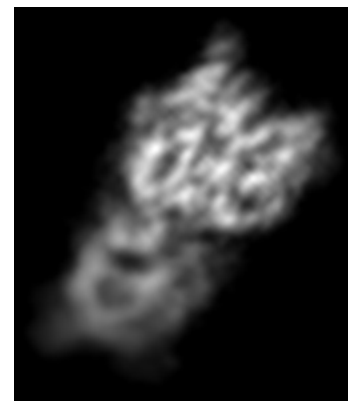
6.1.1 Primary map



X



Y

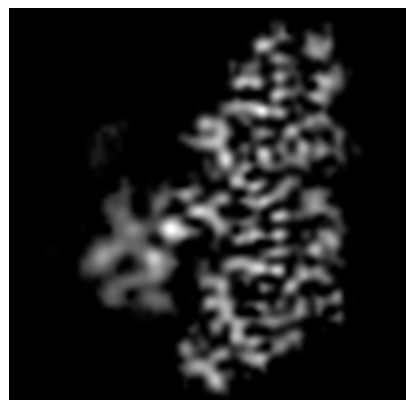


Z

The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

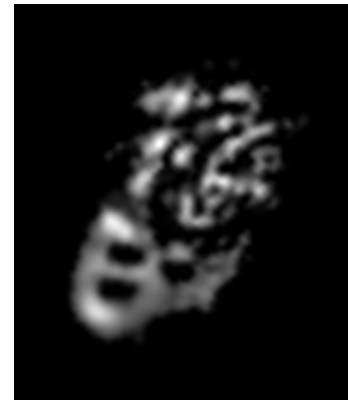
6.2.1 Primary map



X Index: 33



Y Index: 39



Z Index: 38

The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

6.3.1 Primary map



X Index: 25



Y Index: 45



Z Index: 26

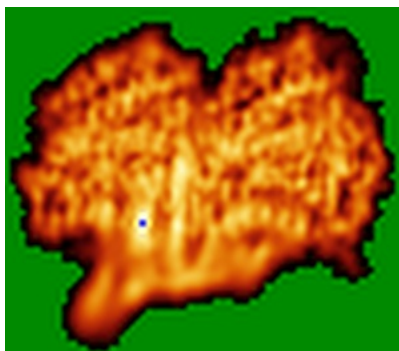
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [i](#)

6.4.1 Primary map



X



Y

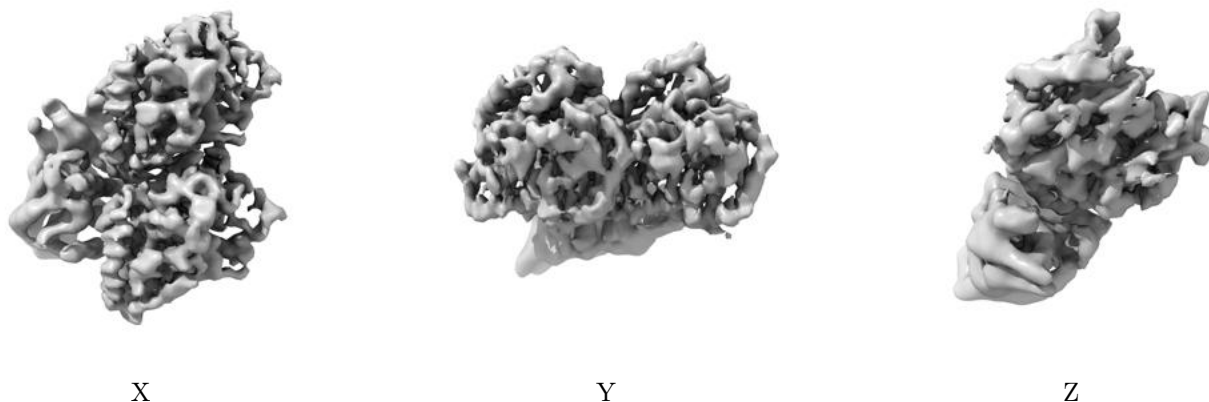


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.05. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

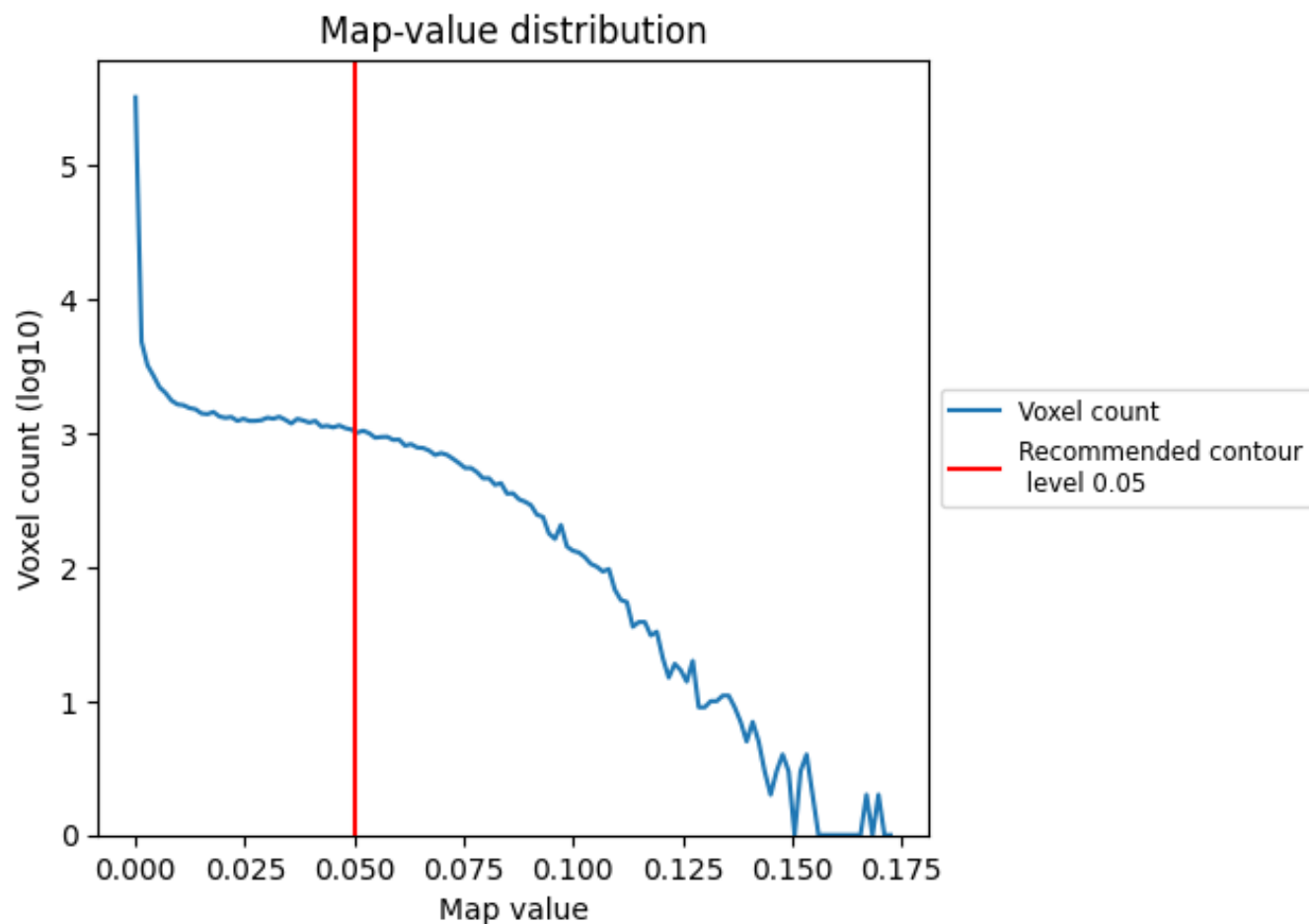
6.6 Mask visualisation [i](#)

This section was not generated. No masks/segmentation were deposited.

7 Map analysis [i](#)

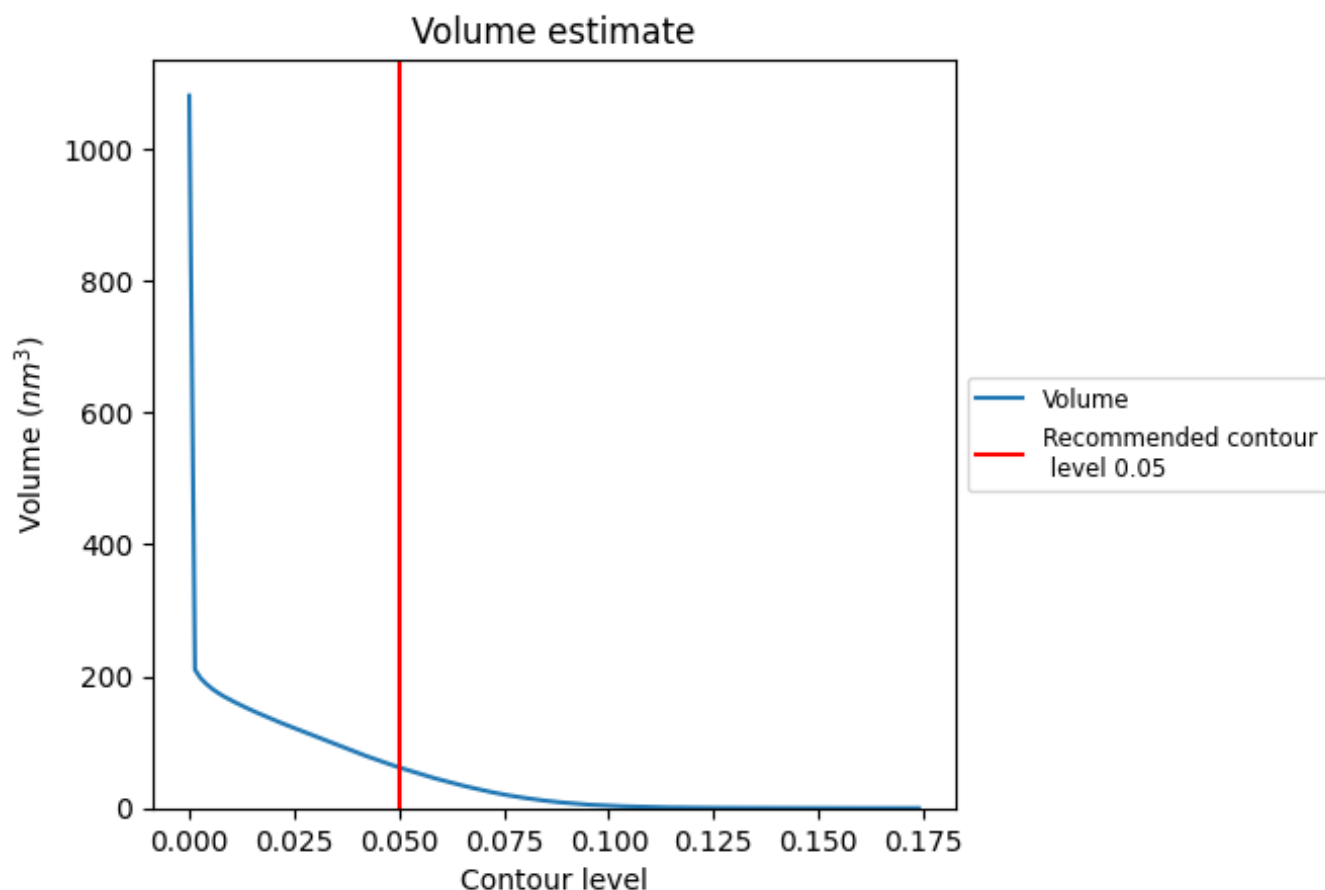
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

7.2 Volume estimate [i](#)



The volume at the recommended contour level is 62 nm^3 ; this corresponds to an approximate mass of 56 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

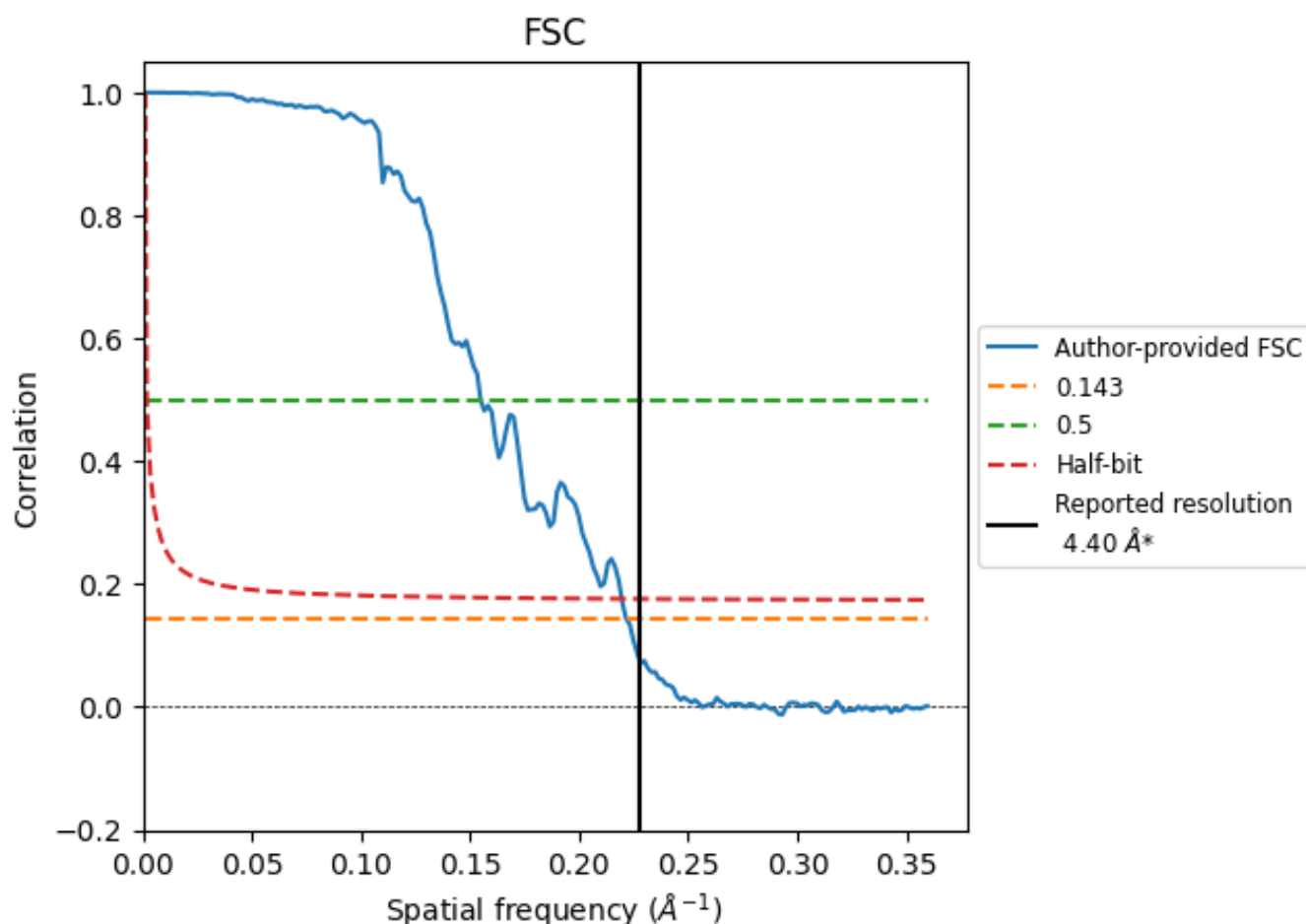
7.3 Rotationally averaged power spectrum [i](#)

This section was not generated. The rotationally averaged power spectrum is only generated for cubic maps.

8 Fourier-Shell correlation [i](#)

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC [i](#)



*Reported resolution corresponds to spatial frequency of 0.227 Å⁻¹

8.2 Resolution estimates [i](#)

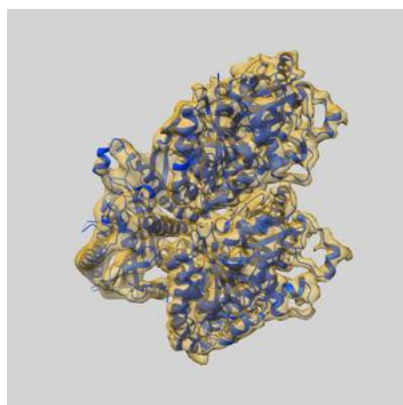
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.40	-	-
Author-provided FSC curve	4.51	6.46	4.56
Unmasked-calculated*	-	-	-

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

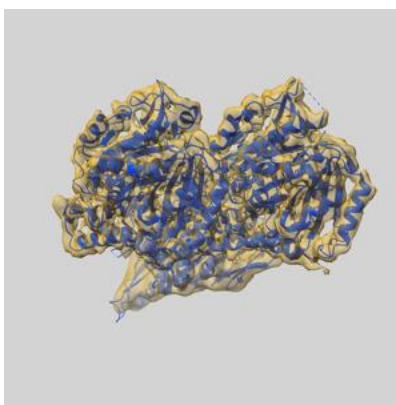
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-12257 and PDB model 7NB8. Per-residue inclusion information can be found in section [3](#) on page [8](#).

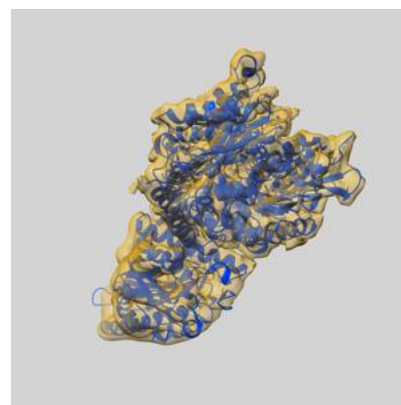
9.1 Map-model overlay [i](#)



X



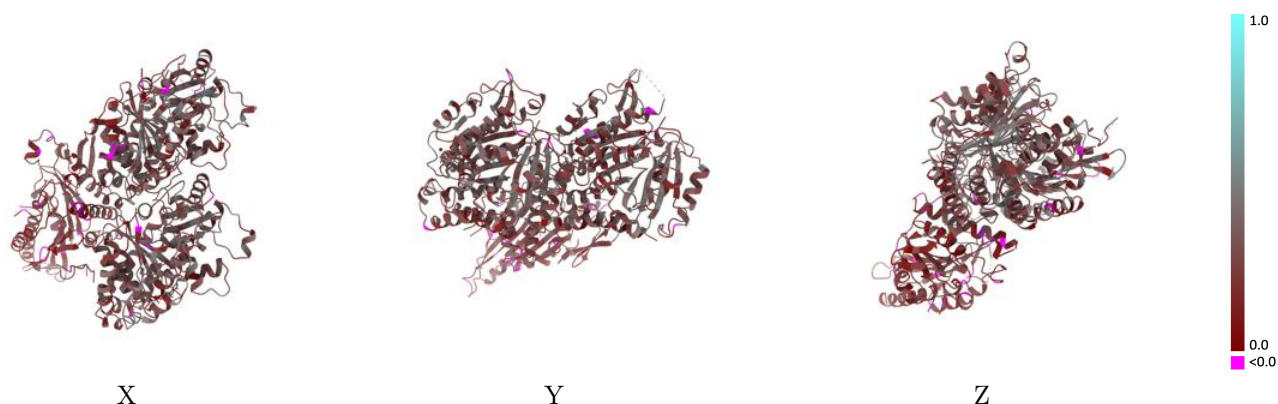
Y



Z

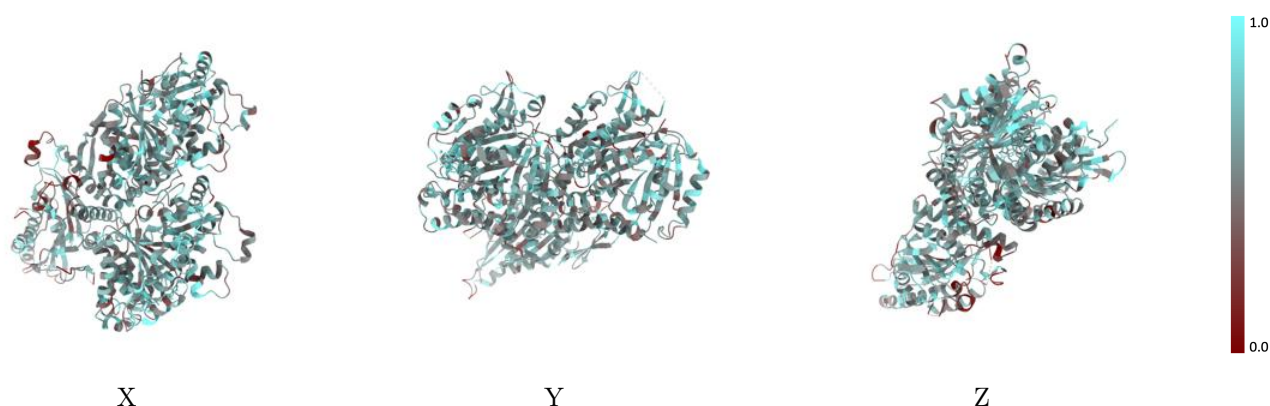
The images above show the 3D surface view of the map at the recommended contour level 0.05 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [i](#)



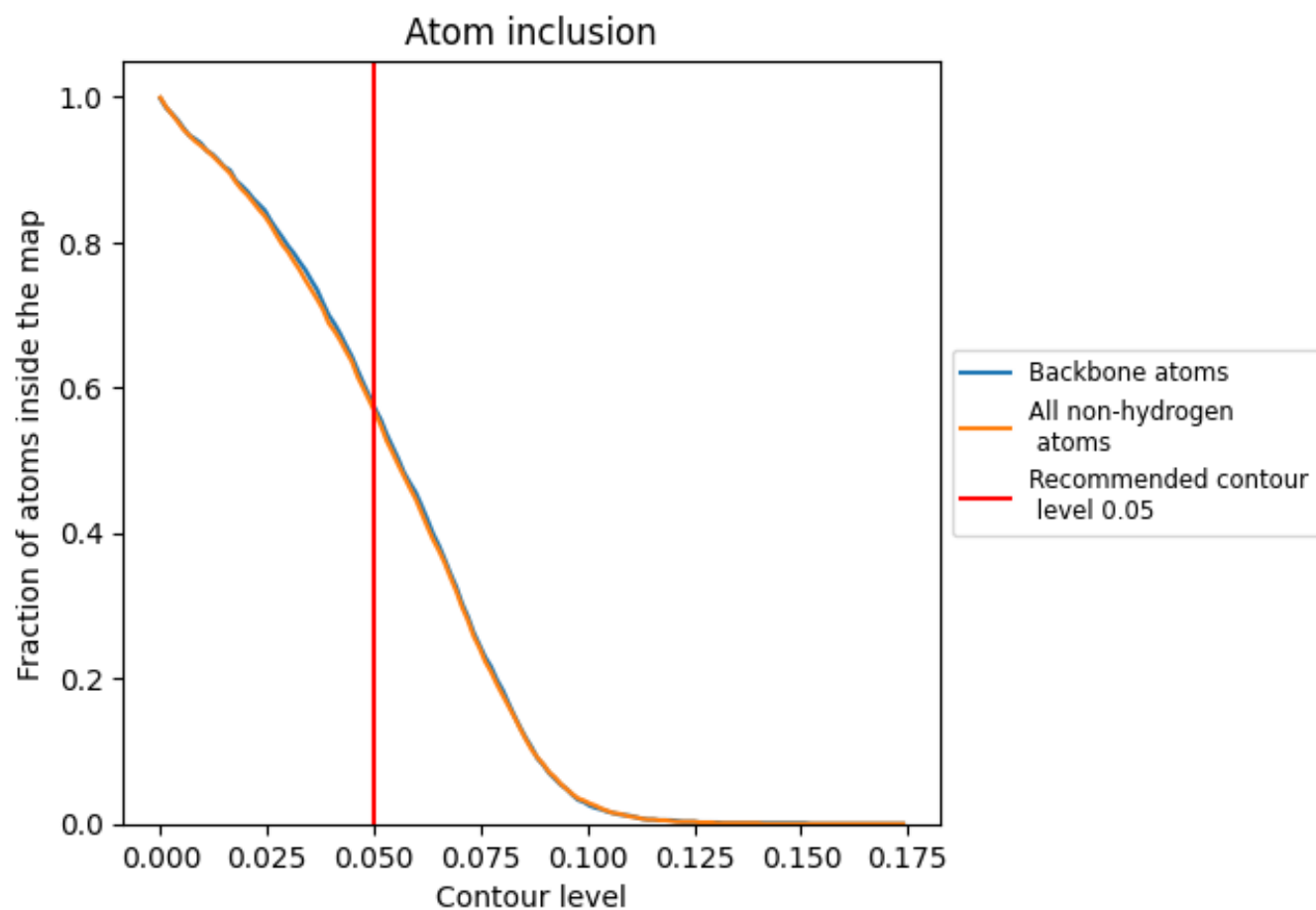
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

9.3 Atom inclusion mapped to coordinate model [i](#)



The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.05).

9.4 Atom inclusion [i](#)



At the recommended contour level, 57% of all backbone atoms, 57% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary ⓘ

The table lists the average atom inclusion at the recommended contour level (0.05) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.5690	0.2680
A	0.5990	0.3060
B	0.6030	0.3120
K	0.5490	0.1610

